CLAIMS

What is claimed:

1. An apparatus for measuring the mass of analyte molecules by means of mass spectrometry, said apparatus comprising:

a spectrometer tube;

vacuum means for applying a vacuum to the interior of said tube;

electrical potential means within the tube for applying an accelerating electrical potential to desorbed analyte molecules;

sample presenting means removably insertable into said spectrometer means, for presenting said analyte molecules in association with a matrix material for promoting desorption and ionization of said analyte molecules, said sample presenting means being adapted to present said analyte molecules on or above the surface of said matrix material, whereby at least a portion of said analyte molecules not consumed in said mass spectrometry analysis will remain accessible for subsequent chemical analytical procedures;

laser beam means for producing a laser beam directed to said analyte molecules and matrix material on said sample presenting means inserted into said spectrometer means, for imparting sufficient energy to desorb and ionize a portion of said analyte molecules on said sample presenting means; and

detector means associated with said spectrometer tube for detecting the impact of accelerated ionized analyte molecules thereon.

2. A method in mass spectrometry to measure the mass of an analyte molecule, said method comprising the steps of:

derivitizing a surface on a probe tip face with an affinity reagent having means for selectively bonding with an analyte molecule;

exposing said derivitized probe tip face to a source of said analyte molecule so as to bond said analyte molecule thereto;

placing the probe tip into one end of a time-of-flight mass spectrometer and applying a vacuum and an electric field to form an accelerating potential within the spectrometer;

striking the probe tip face within the spectrometer with a series of laser pulses in order to desorb ions of said analyte molecules from said tip;

detecting the mass weights of the ions by their time of flight within said mass spectrometer; and

displaying such detected mass weights.

3. The method according to claim 2 comprising additionally applying a desorption assisting matrix material to said probe tip face in association with said affinity reagent, said matrix material being applied in a manner so as not to interfere with said means on said affinity reagent for selectively bonding with said analyte molecules,

a portion of said analyte molecules which are not desorbed from said probe tip remaining chemically accessible for subsequent analytical procedures without the necessity for separating them from said matrix material.

4. The method according to claim 3 comprising additionally,

removing said probe tip from said mass spectrometer;

performing a chemical procedure on said portion of said analyte molecules so as to alter the chemical composition of said portion of said analyte molecules;

reinserting said probe tip with said chemically altered analyte molecules thereon; and

performing a subsequent mass spectrometry analysis to determine the molecular weight of said chemically altered analyte molecules.

5. The method according to claim 2 wherein said affinity reagent is chemically bonded to said face of said probe tip.

6. The method according to claim 2 wherein said affinity reagent is physically adhered to said face of said probe tip.

7. The method according to claim 2 wherein said affinity reagent is adapted to chemically bond to said analyte molecules.

8. The method according to claim 2 wherein said affinity reagent is adapted to biologically adhere to said analyte molecules.

9. The method according to claim 2 wherein said analyte molecules are biomolecules and said affinity reagent is adapted to selectively isolate said biomolecules from an undifferentiated biological sample.

10. The method according to claim 3 wherein said matrix materials are in the weakly acidic to strongly basic pH range.

11. The method according to claim 3 wherein said matrix materials have a pH above 6.0.

12. The method according to claim 2 wherein said face of said probe tip is formed of an electrically insulating material.

13. A method of measuring the mass of analyte molecules by means of laser desorption/ionization, time-of-flight mass spectrometry in which a matrix material is used in conjunction with said analyte molecules for facilitating desorption and ionization of the analyte molecules, the improvement comprising:

presenting the analyte molecules on or above the surface of the matrix material, whereby at least a portion of the analyte molecules not desorbed in said mass spectrometry analysis remain chemically accessible for subsequent analytical procedures, *in situ*, on said probe tip, without the necessity for separating said portion of said analyte molecules from said matrix material.

14. An apparatus for facilitating desorption and ionization of analyte molecules for analysis by mass spectrometry, said apparatus comprising:

a substrate; and

an affinity reagent attached to said substrate and having means for selectively bonding with said analyte molecules.

15. The apparatus according to claim 14 wherein said substrate comprises the surface of a probe tip for use in a time-of-flight mass spectrometry analyzer.

16. The apparatus according to claim 14 wherein said affinity reagent is chemically bonded to said substrate.

17. The apparatus according to claim 14 wherein said affinity reagent is physically adhered to said substrate.

18. The apparatus according to claim 14 wherein said affinity reagent is adapted to chemically bond to said analyte molecules.

19. The apparatus according to claim 14 wherein said affinity reagent is adapted to biologically adhere to said analyte molecules.

20. The apparatus according to claim 14 wherein said analyte molecules are biomolecules and said affinity reagent is adapted to selectively isolate said biomolecules from an undifferentiated biological sample.

21. The apparatus according to claim 14 comprising additionally a matrix material deposited on said substrate in association with said affinity reagent in a manner so as to not render ineffective said means on said affinity reagents for selective bonding with said analyte molecules.

22. The apparatus according to claim 21 wherein said matrix material is in the weakly acidic to strongly basic pH range.

23. The apparatus according to claim 21 wherein said matrix material has a pH above 6.0.

24. The apparatus according to claim 14 wherein said substrate is formed of an electrically insulating material.

25. A method for preparing a surface for presenting analyte molecules for analysis by time-of-flight mass spectrometry, said method comprising:

providing a substrate on said surface for supporting said analyte;

derivitizing said substrate with an affinity reagent having means for selectively bonding with said analyte; and

depositing a desorption/ionization promoting matrix material on said substrate in association with said affinity reagent, said matrix material being deposited in a manner so as to not render ineffective said means on said affinity reagent for selectively bonding with said analyte.

26. A method for preparing a surface for presenting analyte molecules for analysis, said method comprising:

providing a substrate on said surface for supporting said analyte;

derivitizing said substrate with an affinity reagent having means for selectively bonding with said analyte; and

a means for detection of said analyte molecules bonded with said affinity reagent.

27. The method according to claim 26 comprising additionally the step of applying a detection material to said surface.

28. The method according to claim 27 wherein such detection material comprises a fluorescing species.

29. The method according to claim 27 wherein such detection material comprises an enzymatic species.

30. The method according to claim 27 comprising additionally wherein such detection material comprises a radioactive species.

31. The method according to claim 27 comprising additionally wherein such detection material comprises a light-emitting species.

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